

REMOTE SENSING WATER MONITORING AND MANAGEMENT USING ARTIFICIAL INTELLIGENCE

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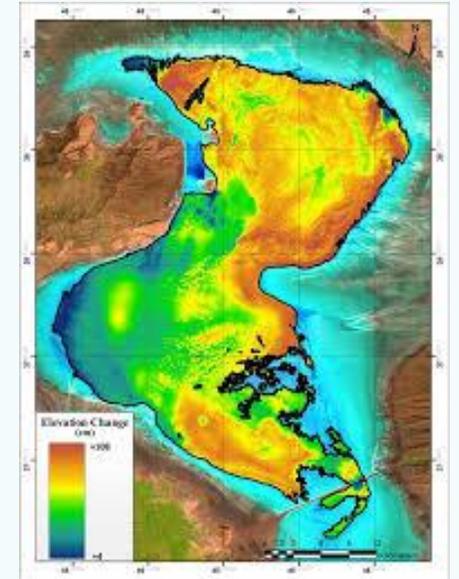
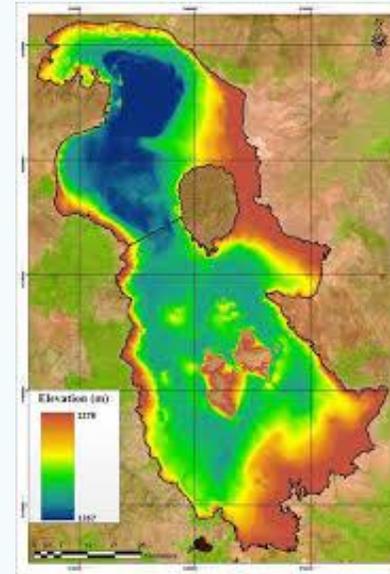


CanadaWTX Inc.

Canada China Environmental Technology (Tianjin) Co., Ltd.

WHAT WE OFFER FOR WATER QUALITY MONITORING BY SATELLITE

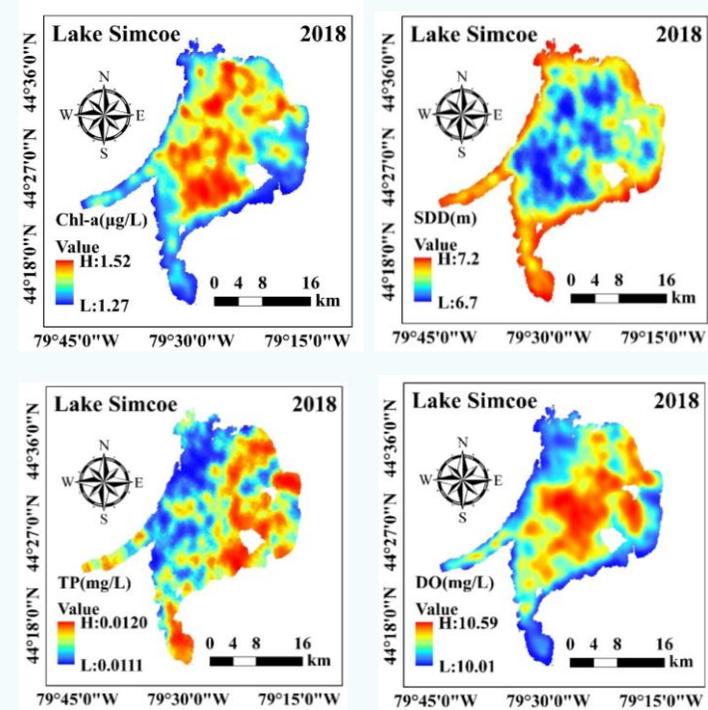
- Water Surface Area and Boundaries
- Water Quality Monitoring
- Optically Active Parameters
- Derived Parameters



Examples for water surface area and boundaries

WHERE OUR APPROACH APPLIES

- Natural Bodies of Water
- Artificial Lakes (Reservoirs)
- Mine Tailings Dams
- Aquaculture Areas
- Offshore Areas



Lake Simcoe, Canada
Results on water quality (TP, DO, SDD, Chl-A)



REMOTE SENSING WATER QUALITY MONITORING AND MANAGEMENT USING ARTIFICIAL INTELLIGENCE

Satellite based remote sensing of water quality monitoring interpreted by artificial intelligence provides **government departments** and **stakeholders** with the dynamic changes in the water environment, water environment safety and water pollution in relevant waters.

It provides a **low-cost, safe, reliable, visual** and **traceable** water monitoring and management system with **high spatial resolution** and **short time resolution** for waterbody protection, emergency response and governance.



ADVANTAGES OF USING ARTIFICIAL INTELLIGENCE

- Fitting correlation between water quality measurements and satellite data
- Big data acquisition and processing capabilities
- More accurate, cheaper and generalized than traditional sampling
- Powerful ability to capture new information (e.g. non-optically active water quality parameters)
- Highly flexible ability to develop models with the rapid development machine learning tools

SATELLITES AND MULTISPECTRAL BANDS USED



Landsat TM/ETM+/OLI
Bands: 430-1380nm



Sentinel-2
Bands: 440-2200nm



Sentinel-1
Bands: C band



SPOT
Bands: 450-890nm



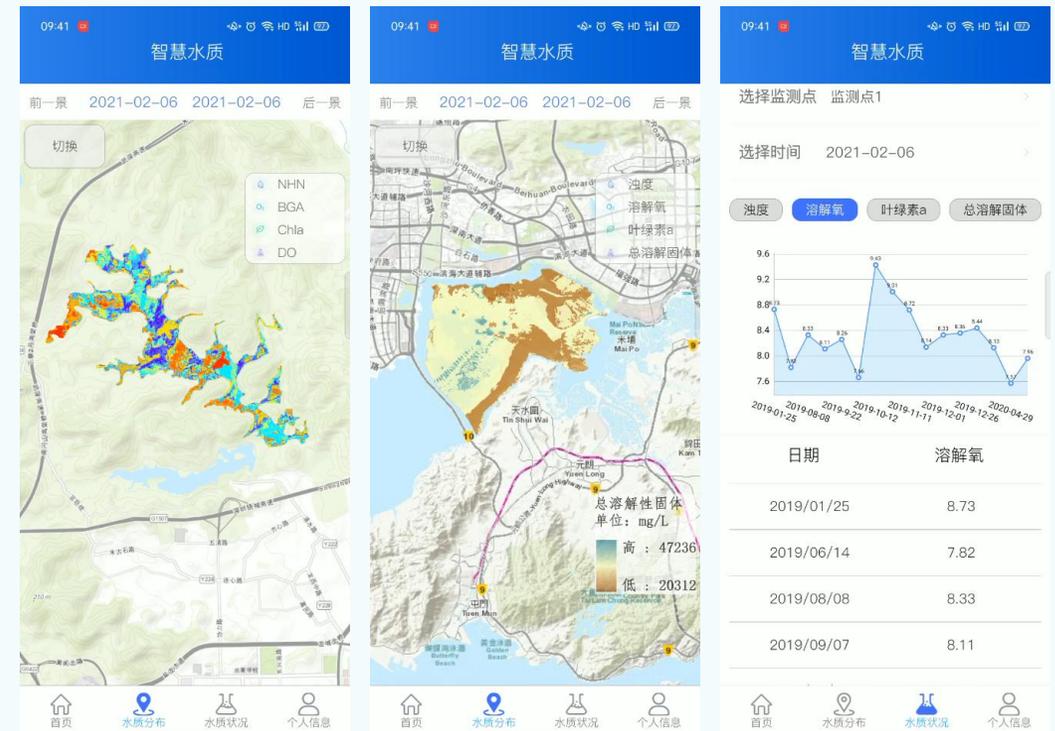
WorldView-4
Bands: 450-920nm



TerraSAR-X
Bands: X band

WATER QUALITY PARAMETERS MONITORED

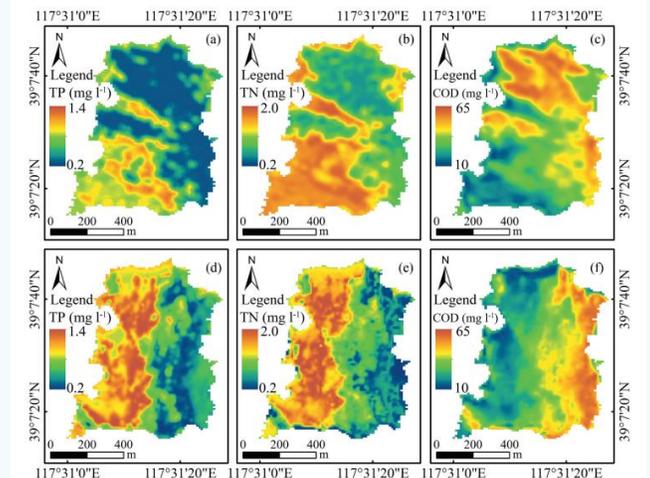
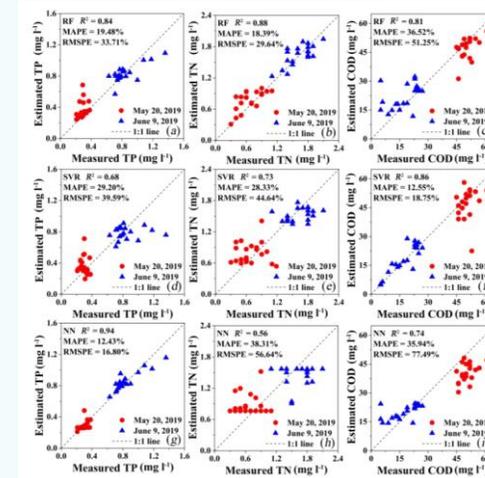
- **Hydrological elements:**
water area, water quality, water temperature
- **Optical sensitivity parameters:**
Chlorophyll A, turbidity, CDOM
- **Non-optically sensitive parameters:**
dissolved oxygen, total dissolved solids, ammonia nitrogen, total phosphorus, total nitrogen



Water quality mapping with multi parameters and time variation

RECENT APPLICATIONS

- Bolong Lake, Tianjin China
- Shenzhen River, Shenzhen China
- Shenzhen Bay, Shenzhen China
- Q Reservoir, Guangdong China
- Lake Simcoe, Canada
- Lake Huron, Canada



Lake Bolong, Northern China
Results on water quality (TP,TN,COD)



ROLE OF ARTIFICIAL INTELLIGENCE

Using a satellite provides data allowing derivation of an appropriate model to use proven AI algorithms, and then using this model to predict future conditions.

Machine learning has strong adaptability, organization, and fault tolerance. It can improve the **accuracy** and **generalization** ability of remote sensing retrieval models through continuous learning, correction and error feedback, and meet the needs of **efficient** and **rapid** water quality monitoring.



ADVANTAGES OF REMOTE SENSING MONITORING

➤ Higher Efficiency Than Traditional Approaches

High spatial resolution data is combined with short time resolution data using remote sensing satellite sensors and **cloud platform** technology. This allows rapid acquisition and processing of images and data with machine learning greatly improving task efficiency.



ADVANTAGES OF REMOTE SENSING MONITORING

➤ More Retrieval of Water Quality Parameters

The powerful data mining capabilities of artificial intelligence and machine learning eliminates the traditional remote sensing water quality retrieval methods. It deeply explores the relationship between remote sensing reflectance and water quality parameters, and allows the retrieval of **non-light sensitive parameters** such as total phosphorus and total nitrogen.



ADVANTAGES OF REMOTE SENSING MONITORING

➤ More Accurate Retrieval Accuracy

Artificial intelligence has strong **adaptability** and **self-learning ability**. Based on the traditional empirical and semi-empirical remote sensing water quality retrieval methods, the model is continuously trained to reduce the loss function error, thereby greatly improving the prediction accuracy of water quality parameters.



ADVANTAGES OF REMOTE SENSING MONITORING

➤ More Convenient Real-time Monitoring

Based the evolving **5G** technology it is now possible to achieve a complete service system of water quality visualization. This includes mapping services plus front-end data access and presentation. It can also integrate mature images and processing procedures into mobile phones to facilitate **real-time monitoring**.



ADVANTAGES OF REMOTE SENSING MONITORING

➤ More Suitable Atmospheric Calibration Method

By comparing the atmospheric correction effects of different atmospheric correction methods on inland water bodies, through artificial intelligence and machine learning, the **atmospheric correction methods** suitable for different optical water body classifications are determined, providing a more accurate data source for water quality remote sensing.



THE TEAM



Chris Twigge-Molecey
PhD., P.Eng



Jeanne Huang
PhD., Professor



James Li
PhD., Professor



Ravi Selvagnapathy
PhD., Professor



Ghani Raqazpur
PhD., Professor



Ed McBean
PhD., Professor

COLLABORATORS





CONTACT US

Canada

CanadaWTX Inc.

China

Canada China Environmental
Technology (Tianjin) Co., Ltd.



info@canadawtx.com



+1 289 8855978



www.CanadaWTX.com

